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February 2, 2021

U.S. DOE Portsmouth/Paducah Project Office
c/o Contracting Officer
1017 Majestic Drive
Lexington, KY 40513

U.S. DOE Portsmouth/Paducah Project Office
c/o Contracting Officer Representative
5501 Hobbs Road
Kevil, KY 42053

RE: Grant #DE-EM0005189
2021 Annual Environmental Sampling/Monitoring Plan

Dear Contracting Officer and Contracting Officer Representative:

Please find the attached report in regards to the contract requirements per AIP Grant #DE-EM0005189.

If you have any questions or require additional information, please contact Chris Travis at (502)782-5897 or email at christopher.travis@ky.gov.

Sincerely,

Brian D. Begley, P.G., FFA Manager
Paducah Site Section Supervisor
Hazardous Waste Branch

BDB/cct/lww

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Attachments: Tables 1 - 6

Figures 1 - 4

DWM File: #470; Graybar: ARM20210002

COMMONWEALTH OF KENTUCKY
AGREEMENT IN PRINCIPLE

2021 ENVIRONMENTAL SAMPLING STRATEGY DOCUMENT

January 25, 2021

I. INTRODUCTION

The Agreement in Principle (AIP) is an agreement between the Commonwealth of Kentucky and the Department of Energy (DOE) to provide assurances that environmental activities at the Paducah Gaseous Diffusion Plant (PGDP) are conducted in a scientific and sound manner. The Agreement is intended to maintain an independent, impartial, and qualified assessment of the environmental impacts into past, present and future DOE activities at the PGDP. This AIP "Environmental Sampling Strategy Document" provides a description and rationale for all environmental sampling activities planned by the Commonwealth of Kentucky staff in 2021. The goal and activities outlined in this plan are designed to prevent or minimize negative environmental impacts as various types of site activities are carried out in and around the PGDP.

This plan is updated and revised annually or when determined necessary. A very important premise of this document is that it can be easily reviewed and changed, as issues and knowledge progress. There will be no data results associated with this document; it is a plan that outlines a sampling strategy and rationale. Data results and interpretation will be transmitted to DOE (per requirements set forth in the AIP grant) and presented in the "AIP Annual Report."

The Cabinet for Health and Family Services (CHFS) Radiation Health Branch (RHB) AIP presents their own "Environmental Sampling Strategy Document" and schedule to DOE. This plan specifically covers the Energy and Environment Cabinet (EEC) activities associated with the PGDP.

II. MISSION STATEMENT

The purpose of the AIP Sampling Plan is to assist in providing an independent evaluation of Quality Assurance/Quality Control (QA/QC) of DOE environmental sampling programs for the Environmental Restoration activities at the PGDP. This is accomplished by reviewing and commenting on a variety of DOE/contractor procedures, as well as observing DOE/contractor field sampling practices. The AIP is also responsible for independent and split sampling of environmental samples from a wide variety of locations (e.g. groundwater monitoring wells, residential groundwater wells, stream sediments, outfalls, surface waters, and biota). Independent sampling is performed when the AIP deems it necessary to augment current DOE sampling efforts in order to independently verify their results.

The KY AIP Environmental Monitoring Program is designed to provide an independent assessment on the quality of the human and ecological environment in and around the PGDP.

III. MAJOR CONTAMINANTS OF CONCERN IN GROUNDWATER

Currently, two groundwater contaminant plumes have been delineated offsite; the Northeast and Northwest Plumes. Both plumes are known to be present in the Regional Gravel Aquifer (RGA) and flow from the plant, north toward the Ohio River. The primary contaminants of concern for the Northwest Plume are Trichloroethylene (TCE) and Technetium (Tc-99). TCE is the primary contaminant within the Northeast Plume. TCE was once widely used at the plant as a degreasing agent and is thought to exist as a dense non-aqueous phase liquid (DNAPL) within the RGA at locations within the plant fence line. It is hypothesized that DNAPL may also occur as residual pockets within the UCRS and as pockets and stringers within the RGA. As it slowly dissolves, it produces dissolved-phase plumes, which then travel offsite. Tc-99 is a product of nuclear fission and was introduced at the site when spent nuclear fuel was sent to Paducah for reprocessing.

The exact locations of sources to off-site contaminant plumes are not fully understood and multiple sources for each plume are likely. DOE believes that the C-400 area has contributed the most TCE to the dissolved phase Northwest Plume (Garner, Morti, and Smuin, 1995). The C-400 area is also believed to be responsible for much of the Northeast Plume contamination (DOE, 1997). This belief is supported by subsurface sampling and process knowledge concerning activities at the C-400 building, where as much as 23,000 gallons of TCE per month were used during peak operations in the 1970s.

The release mechanism for Tc-99 has not been determined, but is thought to originate at the C-400 building where a recovery process occurred. Tc-99 derived from reprocessed fuel rods has contaminated the enrichment cascade buildings. Tc-99 is a neutron absorber and was removed during the enrichment process. The disposal practices for Tc-99 have not been documented, there is an account of a spill inside the C-400 building, and it has been theorized that Tc-99 may have been placed in the C-404 landfill, the C-749 burial ground, and other burial grounds on site.

The area of highest TCE and Tc-99 concentrations in RGA groundwater are found near the C-400 Building, the primary source for the Northwest Plume. At C-400, levels of TCE contamination are highest near the building's southeastern corner; whereas, Tc-99 tends to be highest at the northwest corner of the building. This understanding may change as results from ongoing C-400 Complex Operable Unit field investigative activities become available. The highest concentration of TCE within the Northeast Plume lies along the plume's southeastern edge. Several source actions have been completed around the C-400 building and now the focus has shifted to investigating and ultimately remediating the area located under the C-400 building.

IV. GROUNDWATER MONITORING STRATEGY IS INTENDED TO INTERGRATE SAMPLING EFFORTS TO MEET SEVEN BROAD GOALS:

A. Further validate DOE's sampling/analytical procedures through split sampling or observations of ~5% of the year's events. Confirmation of DOE analytical results typically performed on the following analysis: Volatile Organic Compounds (VOCs), Tc-99, metals, isotopic radionuclides and PCBs. The AIP will compare the results and report if observed procedures are followed and meet quality standards with findings reported in the Annual Summary Report;

B. Monitor areas where contaminant plume migration is potentially occurring (e.g. fringes of the plume boundaries);

C. Monitor the effectiveness of hydraulic containment systems by monitoring wells that are located in the NW Plume and NE Plume. Monitoring any changes from the Pump and Treat systems to assess the cone of depression and the potential by-pass of higher concentration dissolved phase areas passing around or under the extraction wells.

D. Sample a subset of residential wells to monitor for the presence of TCE and Tc-99 contamination, in order to compare results against established drinking water standards;

E. Monitor the TCE concentrations upwelling from the Northwest Plume into the Little Bayou Creek and walk the creek periodically searching (visually or with instrumentation) for new or migrating seeps;

F. Monitor the water elevations in 19 monitoring wells on the Tennessee Valley Authority (TVA) property as part of a quarterly site wide synoptic groundwater elevation monitoring event;

The AIP groundwater sampling program is designed to meet these six goals while minimizing the number of samples collected through the selection of strategic sampling locations. Table 1 shows all the 2021 sampling planned as part of the AIP sampling program. Table 2 provides the sampling frequency of residential wells, monitoring wells, and seeps that will be split with DOE, or sampled independently by AIP. Table 3, 4, and 5 provide x and y coordinate sample locations. Table 6 provides the x and y coordinates of each TVA synoptic water level collection point. Figure 1 shows the locations of the residential wells to be sampled. Figure 2 shows the locations of the outfalls to be sampled. Figure 3 shows the locations of the monitoring wells and seeps to be sampled. Figure 4 shows the TVA monitoring wells used to obtain water elevations during the quarterly synoptic groundwater elevation events. All analytical and field data gathered by AIP undergoes a QA/QC review process prior to being formatted and transmitted electronically to Four Rivers Nuclear Partnership, for entry into the PEGASIS Data Base.

The Cabinet for Health and Family Services (CHFS) of Frankfort, Kentucky, analyzes KDWM AIP samples collected for radiological constituents. McCoy and McCoy Laboratories, Inc. is to conduct analysis of Whole Effluent Toxicity (WET) testing from selected outfalls. Kentucky Department for Environmental Protection Laboratory, Frankfort, Kentucky is utilized to analyze all of the other (non-rad) constituents.

A) Confirmatory Sampling

The AIP has an obligation to provide confirmation that sampling procedures and analytical results reported by DOE are credible, accurate, and being observed/followed at the Paducah Site. The AIP strategy devised to accomplish this objective involves splitting samples with DOE on a regular basis, as well as augmenting DOE's sampling program with independent AIP sampling events. Split sampling, between DOE and AIP, will occur during planned sampling events such as, routine groundwater monitoring, removal actions, technology demonstrations, and environmental investigations. AIP staff will review DOE Contractor procedures related to sampling and look for adherence in the field. On occasion AIP will collect deionized water samples from the contractor in charge of groundwater monitoring to assure certain water quality standards are being met.

The list of routine analytes that could be collected during a confirmatory sampling event may include: 1a) volatiles encompassed in VOC 8260B; 1b) Gross Alpha, Gross Beta and gamma spectroscopy; 1c) metals 6010C; 1d) PCBs 8082A; 1e) isotopic uranium; 1f) uranium (metal); 1g) total suspended solids (TSS); 1h) Chronic Whole Effluent Toxicity (WET); 1i) Acute Whole Effluent Toxicity (WET); and 1j) Hardness. Basic geochemical parameters measured in the field include temperature, pH, dissolved oxygen, conductivity, oxygen reduction potential (ORP) and turbidity.

B) Monitoring of Plume Growth and Migration

The AIP will augment DOE's sampling program to ensure that the spread of the contaminant plumes are adequately being monitored spatially and temporally. The Northeast plume's eastern edge is near the DOE's

Water Policy Box administrative boundary. This close proximity requires careful monitoring to ensure that early detection is provided for residents living near the boundary that are not currently under protection of the Water Policy Area. In addition, the AIP is monitoring areas to the west and north of the plant in order to monitor the impact of the Northwest and Southwest plumes. If data indicates that the Northeast plume has crossed the Water Policy boundary, DOE will immediately be notified and steps will be taken to notify residents and sample all potentially affected residential wells. TCE is the primary analyte measured; however, Gross Alpha, Gross Beta and gamma spectroscopy may periodically be sampled due to public concern. Basic geochemical parameters will also be measured, including turbidity, temperature, pH, dissolved oxygen, conductivity and ORP.

C) Monitoring the Effectiveness of the Hydraulic Containment Systems

The AIP will continue to review results of DOE's sampling of existing wells to monitor the effectiveness of the current Northwest and Northeast plume hydraulic containment (i.e. Pump-N-Treat) systems. DOE currently monitors wells in the immediate vicinity of the extraction wells. The AIP will independently monitor and sample selected locations on a routine basis. TCE, Gross Alpha, Gross Beta and gamma spectroscopy will be the primary analytes measured in samples obtained from these wells. Basic physical and geochemical parameters will also be measured, including water level, turbidity, temperature, pH, dissolved oxygen, conductivity and ORP.

This information will be used to detect temporal changes in the groundwater elevation that may be occurring due to plant shutdown activities associated with utility optimization activities and help assess the cone of depression.

D) Residential Well Monitoring Program

The AIP collects water samples from residential wells located near and outside the Water Policy Box of the PGDP. Groundwater samples may also be collected (at the request of the landowner) within ~2.5 (two and a half) mile radius from the PGDP or if the determination has been made that the underlying aquifer could reasonably be impacted by the PGDP plumes. This will be done on a case-by-case basis, at the discretion of Kentucky. The AIP is primarily concerned about environmental contamination in residential wells and does not sample for biological or sanitary conditions. The AIP recommends for residents consuming groundwater, to have additional biological testing performed to assure their well is free from harmful bacteria and viruses. TCE, Gross Alpha, Gross Beta and gamma spectroscopy will be the primary analytes measured but samples may also be tested for metals, PFAS and PCBs. All results will be provided to the landowners and DOE. Basic physical and geochemical parameters will also be measured including water level, turbidity, temperature, pH, dissolved oxygen, conductivity and ORP.

If any of the samples collected by KY AIP are contaminated with constituents that could pose a health threat, immediate notification, both verbal and written, will be provided to the resident and DOE. A resampling event with an expedited 7-day laboratory turn around will follow to confirm the sampling results. The property owner and/or resident will be notified regardless of the results of the tests. A letter explaining the results will be sent by KDWM AIP to the resident and DOE soon after the results are compiled.

E) Monitor the TCE Concentrations Upwelling from the Northwest Plume into the Little Bayou Creek.

In 2021 AIP will split two of the four scheduled DOE contractor seep-sampling events to compare results and confirm sampling procedures are being followed. AIP will also conduct monthly transects of Little Bayou Creek and sample any seeps that are present or discovered.

F) Monitoring Water Elevations at TVA During Site Wide Synoptic Water Measuring Events.

The AIP will augment DOE's synoptic site wide groundwater measuring event by requesting access to the Tennessee Valley Authority (TVA) facility, located north of the facility. Water level elevations and associated

barometer readings will be obtained during the same week as the PGDP site wide synoptic water elevation measurement event. The data will be compiled and transmitted to DOE in order to augment and refine the understanding of the groundwater flow conditions near the Ohio River, located within the PGDP groundwater model domain.

References:

Department of Energy. 1997. Integrated Remedial Investigation/ Feasibility Study Work Plan for Waste Area Grouping 6 at Paducah Gaseous Diffusion Plant Paducah, Kentucky, DOE/OR/07-1243&D4, Department of Energy, Paducah, Kentucky.

Department of Energy. 2021. Environmental Monitoring Plan Fiscal Year 2021 Paducah Gaseous Diffusion Plant, Paducah, Kentucky, CP2-ES-0006/FR2

Garner, L.K., E.E. Morti, and D.R. Smuin. 1995. *Northeast Plume Preliminary Characterization Summary Report,* DOE/OR/07-1339&D2, KY/ER-65&D2, Environmental Management and Enrichment Facilities, Paducah Gaseous Diffusion Plant, Paducah, Kentucky, July.

Well#	Location	Screen Zone	Goals	January	February	March	April	May	June	July	August	September	October	November	December	DOE Schedule
R2	residential well	unknown	A(1a, 1b), B, D		AIP	RHB			RHB			RHB			RHB	Quarterly
R10	residential well	unknown	A(1a, 1b), B, D		AIP	RHB			RHB			RHB			RHB	Quarterly
R13	residential well	unknown	A(1a, 1b), B, D		AIP	RHB			RHB			RHB			RHB	Quarterly
R14	residential well	unknown	A(1a, 1b), B, D		AIP											Quarterly
R26	residential well	unknown	A(1a, 1b), B, D		AIP	RHB			RHB			RHB			RHB	Quarterly
R53	residential well	unknown	A(1a, 1b), B, D		AIP											Quarterly
R245	residential well	unknown	A(1a, 1b), B, D		AIP											Quarterly
R9*	residential well	unknown	A(1a, 1b), B, D			RHB			RHB	Split		RHB			RHB	Annual
R20	residential well	RGA	A(1a, 1b), B, D							Split						Annual
R21	residential well	unknown	A(1a, 1b), B, D			RHB			RHB	Split		RHB			RHB	Annual
R83	residential well	unknown	A(1a, 1b), B, D							Split						Annual
R90*	residential well	unknown	A(1a, 1b), B, D							Split						Annual
R114*	residential well	RGA	A(1a, 1b), B, D							Split						Annual
R302	residential well	RGA	A(1a, 1b), B, D							Split						Annual
R6	residential well	RGA	A(1b), B, D			RHB			RHB			RHB			RHB	NS
R40	residential well	RGA	A(1b), B, D			RHB			RHB			RHB			RHB	Quarterly
R253	residential well	RGA	A(1b), B, D			RHB			RHB			RHB			RHB	NS
MW84A	C-404	MRGA	A(1a, 1b, 1c, 1e), B	AIP									Split			Semiannual
MW87A	C-404	MRGA	A(1a, 1b, 1c, 1e), B	AIP									Split			Semiannual
MW90A	C-404	URGA	A(1a, 1b, 1c, 1e), B	AIP									Split			Semiannual
MW93A	C-404	MRGA	A(1a, 1b, 1c, 1e), B	AIP									Split			Semiannual
MW420	C-404	URGA	A(1a, 1b, 1c, 1e), B	AIP									Split			Semiannual
MW548	C-404	RGA	A(1a, 1b, 1c, 1e), B	AIP									Split			Biennial 2019
MW66	NW Plume	RGA	A(1a, 1b), B, C									Split				Semiannual
MW238	NW Plume	RGA	A(1a, 1b), B, C				AIP							AIP		NS
MW98	NW Plume	RGA	A(1a, 1b), B, C						AIP							Semiannual
MW146	NW Plume	RGA	A(1a, 1b), B, C			AIP			AIP							Quarterly
MW249	NW Plume	MRGA	A(1a, 1b), B, C			AIP					AIP					NS
MW236	NW Plume	RGA	A(1a, 1b), B, C			AIP										Semiannual
MW257	NW Plume	RGA	A(1a, 1b), B, C								AIP					Triennial 2019
MW261	NW Plume	LRGA	A(1a, 1b), B, C			AIP										Semiannual
MW339	NW Plume	LRGA	A(1a, 1b), B, C									Split				Semiannual
MW381	NW Plume	RGA	A(1a, 1b), B, C									AIP				Triennial 2019
MW427	NW Plume	RGA	A(1a, 1b), B, C									AIP				Quarterly
MW442	NW Plume	LRGA	A(1a, 1b), B, C			AIP										Biennial 2019
MW460	NW Plume	LRGA	A(1a, 1b), B, C			AIP										Quarterly
MW455	NW Plume	RGA	A(1a, 1b), B, C			split										Semiannual
MW456	NW Plume	RGA	A(1a, 1b), B, C			split										Semiannual
MW498	NW Plume	LRGA	A(1a, 1b), B, C			AIP										Semiannual
MW502	NW Plume	LRGA	A(1a, 1b), B, C					AIP						AIP		Semiannual
MW133	NW Plume	McNairy	A(1a, 1b), B, C					AIP								Semiannual
MW247	NW Plume	McNairy	A(1a, 1b), B, C					AIP								Semiannual
MW356	NE Plume	RGA/McNairy	A(1a, 1b), B, C					AIP								Semiannual
MW252	NE Plume	LRGA	A(1a, 1b), B, C									AIP				Annual
MW294A	NE Plume	RGA	A(1a, 1b), B, C						AIP							NS

MW469	NE Plume	MRGA	A(1a, 1b), B, C						AIP							Annual
MW470	NE Plume	LRGA	A(1a, 1b), B, C								AIP			AIP		Annual
MW472	NE Plume	LRGA	A(1a, 1b), B, C									AIP				Annual
MW533	NE Plume	RGA	A(1a, 1b), B, C					AIP					AIP			Quarterly
MW529	NE Transect Wells	RGA	A(1a, 1b), B, C		AIP			AIP			AIP			AIP		Quarterly
MW203	SW Plume	RGA	A(1a, 1b), B, C			AIP										Annual
MW139	C-746 Plume	RGA	A(1a, 1b), B, C						AIP							Semiannual
MW366	C-746 LF	URGA	A(1a, 1b, 1c), B									AIP				Quarterly
MW575 (proposed)	SWMU 211a	URGA	A(1a, 1b, 1c), B													Quarterly
MW577 (proposed)	SWMU 211a	URGA	A(1a, 1b, 1c), B													Quarterly
MW579 (proposed)	SWMU 211a	URGA	A(1a, 1b, 1c), B													Quarterly
MW581 (proposed)	SWMU 211a	URGA	A(1a, 1b, 1c), B													Quarterly
SHF-D10	TVA/Synoptic	URGA	F		WL			WL			WL			WL		NS by DOE
SHF-D11B	TVA/Synoptic	URGA	F		WL			WL			WL			WL		NS by DOE
SHF-D17	TVA/Synoptic	URGA	F		WL			WL			WL			WL		NS by DOE
SHF-D27	TVA/Synoptic	URGA	F		WL			WL			WL			WL		NS by DOE
SHF-D30B	TVA/Synoptic	URGA	F		WL			WL			WL			WL		NS by DOE
SHF-D74B	TVA/Synoptic	URGA	F		WL			WL			WL			WL		NS by DOE
SHF-D75B	TVA/Synoptic	URGA	F		WL			WL			WL			WL		NS by DOE
SHF-D8A	TVA/Synoptic	URGA	F		WL			WL			WL			WL		NS by DOE
SHF-201A	TVA/Synoptic	UCRS	F		WL			WL			WL			WL		NS by DOE
SHF-201B	TVA/Synoptic	URGA	F		WL			WL			WL			WL		NS by DOE
SHF-201C	TVA/Synoptic	URGA	F		WL			WL			WL			WL		NS by DOE
SHF-201B	TVA/Synoptic	URGA	F		WL			WL			WL			WL		NS by DOE
SHF-201C	TVA/Synoptic	URGA	F		WL			WL			WL			WL		NS by DOE
SHF-102G	TVA/Synoptic	URGA	F		WL			WL			WL			WL		NS by DOE
TVAGW-1D	TVA/Synoptic	URGA	F		WL			WL			WL			WL		NS by DOE
TVAGW-2D	TVA/Synoptic	URGA	F		WL			WL			WL			WL		NS by DOE
TVAGW-3D	TVA/Synoptic	URGA	F		WL			WL			WL			WL		NS by DOE
TVAGW-4D	TVA/Synoptic	URGA	F		WL			WL			WL			WL		NS by DOE
TVAGW-5D	TVA/Synoptic	URGA	F		WL			WL			WL			WL		NS by DOE
TVAGW-6D	TVA/Synoptic	URGA	F		WL			WL			WL			WL		NS by DOE
MW135	TVA	LRGA	A(1a, 1b), B, C											AIP		Semiannual
MW433	TVA	RGA	A(1a, 1b), B, C											AIP		Quarterly
MW439	TVA	RGA	A(1a, 1b), B, C								AIP					Biennial 2019
MW147	TVA	RGA	A(1a, 1b), B, C								AIP					NS
MW441	TVA	RGA	A(1a, 1b), B, C					AIP								Quarterly
MW445	TVA	RGA	A(1a, 1b), B, C					AIP								Biennial 2019
MW447	TVA	RGA	A(1a, 1b), B, C											AIP		Biennial 2019
MW178	C-400	URGA	A(1a, 1b), B, C			AIP						AIP				Biennial 2019
MW342	C-400	RGA	A(1a, 1b), B, C			AIP						AIP				Semiannual
MW343	C-400	LRGA	A(1a, 1b), B, C			AIP						AIP				Semiannual
MW421 Port 1	C-400	URGA	A(1a, 1b), B, C				AIP						AIP			Semiannual
MW421 Port 2	C-400	MRGA	A(1a, 1b), B, C				AIP						AIP			Semiannual
MW421 Port 3	C-400	LRGA	A(1a, 1b), B, C				AIP						AIP			Semiannual
MW422 Port 1	C-400	URGA	A(1a, 1b), B, C				AIP						AIP			Semiannual
MW422 Port 2	C-400	MRGA	A(1a, 1b), B, C				AIP						AIP			Semiannual
MW422 Port 3	C-400	LRGA	A(1a, 1b), B, C				AIP						AIP			Semiannual

MW423 Port 1	C-400	URGA	A(1a, 1b), B, C				AIP							AIP		Semiannual
MW423 Port 2	C-400	MRGA	A(1a, 1b), B, C				AIP							AIP		Semiannual
MW423 Port 3	C-400	LRGA	A(1a, 1b), B, C				AIP							AIP		Semiannual
MW424 Port 1	C-400	URGA	A(1a, 1b), B, C					AIP							AIP	Semiannual
MW424 Port 2	C-400	MRGA	A(1a, 1b), B, C					AIP							AIP	Semiannual
MW424 Port 3	C-400	LRGA	A(1a, 1b), B, C					AIP							AIP	Semiannual
MW425 Port 1	C-400	URGA	A(1a, 1b), B, C	AIP				AIP							AIP	Semiannual
MW425 Port 2	C-400	MRGA	A(1a, 1b), B, C	AIP				AIP							AIP	Semiannual
MW425 Port 3	C-400	LRGA	A(1a, 1b), B, C	AIP				AIP							AIP	Semiannual
MW557	C-400	URGA	A(1a, 1b), B, C								Split				AIP	Semiannual
MW558	C-400	MRGA	A(1a, 1b), B, C								Split				AIP	Quarterly
MW559	C-400	LRGA	A(1a, 1b), B, C								Split					Quarterly
MW560	C-400	URGA	A(1a, 1b), B, C						Split							Quarterly
MW561	C-400	MRGA	A(1a, 1b), B, C						Split							Quarterly
MW562	C-400	LRGA	A(1a, 1b), B, C						Split							Quarterly
MW563	C-400	URGA	A(1a, 1b), B, C								Split					Quarterly
MW564	C-400	MRGA	A(1a, 1b), B, C								Split					Quarterly
MW565	C-400	LRGA	A(1a, 1b), B, C								Split					Quarterly
MW566	C-400	URGA	A(1a, 1b), B, C											Split		Quarterly
MW567	C-400	MRGA	A(1a, 1b), B, C											Split		Quarterly
MW568	C-400	LRGA	A(1a, 1b), B, C											Split		Quarterly
MW569	C-400	URGA	A(1a, 1b), B, C								Split					Quarterly
MW570	C-400	MRGA	A(1a, 1b), B, C								Split					Quarterly
MW571	C-400	LRGA	A(1a, 1b), B, C								Split					Quarterly
MW572	C-400	URGA	A(1a, 1b), B, C											Split		Quarterly
MW573	C-400	MRGA	A(1a, 1b), B, C											Split		Quarterly
MW574	C-400	LRGA	A(1a, 1b), B, C											Split		Quarterly
MW161	SWMU 001	RGA	A(1a, 1b), B, C					Split								Semiannual
MW545	SWMU 001	RGA	A(1a, 1b), B, C					Split								Semiannual
MW544	SWMU 001	RGA	A(1a, 1b), B, C			AIP			AIP							Semiannual
K001	Outfall	SW	A(1b, 1c, 1d, 1e, 1f, 1g) B									AIP				Weekly
K010	Outfall	SW	A(1a, 1b, 1c, 1d,1h, 1j), B				AIP									Monthly
K012**	Outfall	SW	A1a, 1b, 1c, 1d, 1i, 1j), B			AIP										Monthly
K013**	Outfall	SW	A(1a, 1b, 1c, 1i, 1j), B		AIP								AIP			Monthly
K020	Outfall	SW	A(1a, b, 1c, 1i, 1j), B		AIP								AIP			Monthly
C-613	Sediment Basin Discharge	SW	A(1b, 1c, 1e, 1f, 1g) B				AIP					AIP				Quarterly
L4	Bayou Creek	SW	A(1b, 1c, 1e, 1f, 1g) B				AIP					AIP				NS
Seeps 2, 5, 6 and 7 ***	Little Bayou Creek	SW	A(1a, 1b), B,C,E	AIP	AIP	AIP	AIP	AIP	AIP	AIP	split	AIP	AIP	split	AIP	Quarterly
FFS/GEO Lab Bldg C-730,	C-730	SW	A(1a)						AIP							NS
Event	**Totals**			**January**	**February**	**March**	**April**	**May**	**June**	**July**	**August**	**September**	**October**	**November**	**December**	
Splits	**39**			**0**	**0**	**2**	**0**	**2**	**3**	**7**	**10**	**2**	**6**	**7**	**0**	
AIP Independent	**124**			**10**	**11**	**14**	**15**	**15**	**8**	**1**	**7**	**12**	**12**	**10**	**9**	
Water Levels	**74**			**0**	**18**	**0**	**0**	**18**	**0**	**0**	**19**	**0**	**0**	**19**	**0**	

Disclaimer: This schedule is subject to change ex. - weather conditions/DOE coordination issues

Goals - are from the 2021 KY AIP Groundwater Stategy Sampling Plan (A - F)
Chemical Analysis
1a) VOC 8260B, 1b) Gross Alpha & Gross Beta/Tc-99, 1c) Metals, 1d) PCBs 8082A, 1e) Isotopic Uranium, 1f) Uranium (Metal),
1g) Total Suspended Solids (TSS), 1h) Chronic Whole Effluent Toxicity (WET), 1i) Acute Whole Effluent Toxicity (WET Ceriodaphnia), 1j) Hardness

WL - water level (only) - synoptic event on TVA wells
split - with DOE
AIP - independent sampling (EEC AIP)
RHB - KY Radiation Health Branch Residential Well
***** - sampled from a spigot/hose
**- sampled based on availability and adequate flow
***- Seep sampling locations depend on presence and water level in creek

Abbreviations Used in Schedule
UCRS - Upper Continental Recharge System
RGA - Regional Gravel Aquifer
URGA - Upper Regional Gravel Aquifer
MRGA - Middle Regional Gravel Aquifer
LRGA - Lower Regional Gravel Aquifer
PRT - Multi-Port monitoring well
NS - not sampled by DOE during the year
SW - Surface Water or Seep
KDFWR - Kentucky Department of Fish and Wildlife Resources
WKWMA - Western Kentucky Wildlife Management Area
LF - Landfill

Table 2

Sampling Frequency of RWs, MWs, and Seeps by DOE and KDWM AIP

Well#	2021 DOE sampling Frequency	Last sampled or on schedule to be sampled by DOE	2021 KDWM AIP sampling Frequency	Last sampled or on schedule to be sampled by AIP
R2	Quarterly	2020	Feb/AIP	2021
R9	Annual	2020	August/Split	2021
R10	Quarterly	2020	Feb/AIP	2021
R13	Quarterly	2020	Feb/AIP	2021
R14	Quarterly	2020	Feb/AIP	2021
R20	Annual	2020	August/Split	2021
R21	Annual	2020	August/Split	2021
R26	Quarterly	2020	Feb/AIP	2021
R53	Quarterly	2020	Feb/AIP	2021
R83	Annual	2020	August/Split	2021
R90	Annual	2020	August/Split	2021
R114	Annual	2020	August/Split	2021
R245	Quarterly	2020	Feb/AIP	2021
R302	Annual	2020	August/Split	2021
MW66	Semiannual	2020	September/Split	2021
MW84A	Semiannual	2020	Jan/AIP, Oct/Split	2021
MW87A	Semiannual	2020	Jan/AIP, Oct/Split	2021
MW90A	Semiannual	2020	Jan/AIP, Oct/Split	2021
MW93A	Semiannual	2020	Jan/AIP, Oct/Split	2021
MW98	Semiannual	2020	June/AIP	2021
MW133	Semiannual	2020	May/AIP	2021
MW135	Semiannual	2020	November/AIP	2021
MW139	Semiannual	2020	June/AIP	2021
MW146	Quarterly	2020	March/AIP, June/AIP	2021
MW147	Biennial	2019	August/AIP	2021
MW161	Semiannual	2020	May/Split	2021
MW178	NS	2012	Mar/AIP, Sep/AIP	2021
MW203	NS	2018	Mar/AIP	2021
MW236	Semiannual	2020	March/AIP	2021
MW238	NS	2010	Apr/AIP, Nov/AIP	2021
MW249	NS	2005	Mar/AIP, Aug/AIP	2021
MW247	Semiannual	2020	May/AIP	2021
MW252	Annual	2020	Sept/AIP	2021
MW257	Triennial	2019	August/AIP	2021
MW261	Semiannual	2020	March/AIP	2021

NS – not sampled

Table 2 (Continued)

Sampling Frequency of RWs, MWs, and Seeps by DOE and KDWM AIP

Well#	2020 DOE sampling Frequency	Last sampled or on schedule to be sampled by DOE	2020 KDWM AIP sampling Frequency	Last sampled or on schedule to be sampled by AIP
MW294A	NS	2005	June/AIP	2021
MW339	Semiannual	2020	September/Split	2021
MW342	Semiannual	2020	Mar/AIP, Sep/AIP	2021
MW343	Semiannual	2020	Mar/AIP, Sep/AIP	2021
MW356	Semiannual	2020	May/AIP	2021
MW366	Semiannual	2020	September/AIP	2021
MW381	Semiannual	2020	September/AIP	2021
MW420	Semiannual	2020	Jan/AIP, Oct/Split	2021
MW421	Semiannual	2020	Apr/AIP, Oct/AIP	2021
MW422	Semiannual	2020	Apr/AIP, Oct/AIP	2021
MW423	Semiannual	2020	Apr/AIP, Nov/AIP	2021
MW424	Semiannual	2020	May/AIP, Dec/AIP	2021
MW425	Semiannual	2020	May/AIP, Dec/AIP	2021
MW427	Quarterly	2020	Sep/AIP	2021
MW433	Quarterly	2020	Dec/AIP	2021
MW439	Biennial	2019	Aug/AIP	2021
MW441	Quarterly	2020	May/AIP	2021
MW442	Biennial	2019	Mar/AIP	2021
MW445	Biennial	2019	May/AIP	2021
MW447	Biennial	2019	Nov/AIP	2021
MW455	Semiannual	2020	March/Split	2021
MW456	Semiannual	2020	March/Split	2021
MW460	Quarterly	2020	March/AIP	2021
MW469	Annual	2020	June/AIP	2021
MW470	Annual	2020	May/AIP, Aug/AIP, Nov/AIP	2021
MW472	Annual	2020	Sept/AIP	2021
MW498	Semiannual	2020	March/AIP	2021
MW502	Semiannual	2020	May/AIP, Nov/AIP	2021
MW529	Quarterly	2020	Feb/AIP, May/AIP, Aug/AIP, Nov/AIP	2021
MW533	Quarterly	2020	May/AIP, Oct/AIP	2021
MW544	Semiannual	2020	Mar/AIP, Jun/AIP	2021
MW545	Semiannual	2020	May/Split	2021
MW548	Biennial	2019	Jan/AIP, Oct/Split	2021
MW557	Quarterly	NA	August/Split	2021
MW558	Quarterly	NA	August/Split	2021
MW559	Quarterly	NA	August/Split	2021
MW560	Quarterly	NA	June/Split	2021

NS – not sampled

Table 2 (Continued)

Sampling Frequency of RWs, MWs, and Seeps by DOE and KDWM AIP

Well#	2020 DOE sampling Frequency	Last sampled or on schedule to be sampled by DOE	2020 KDWM AIP sampling Frequency	Last sampled or on schedule to be sampled by AIP
MW561	Quarterly	NA	June/Split	2021
MW562	Quarterly	NA	June/Split	2021
MW563	Quarterly	NA	August/Split	2021
MW564	Quarterly	NA	August/Split	2021
MW565	Quarterly	NA	August/Split	2021
MW566	Quarterly	NA	November/Split	2021
MW567	Quarterly	NA	November/Split	2021
MW568	Quarterly	NA	November/Split	2021
MW569	Quarterly	NA	August/Split	2021
MW570	Quarterly	NA	August/Split	2021
MW571	Quarterly	NA	August/Split	2021
MW572	Quarterly	NA	November/Split	2021
MW573	Quarterly	NA	November/Split	2021
MW574	Quarterly	NA	November/Split	2021
Seep* 2, 5, 6, & 7	Quarterly	2020	Jan thru July/AIP, Aug/Split, Nov/Split, Sept/AIP, Oct/AIP, Dec/AIP	2021

NS – not sampled
NA – not applicable
***** - Seep sampling locations depend on presence and water level in the creek

Table 3
Residential Well X and Y Coordinates

Well #	X	Y
R2	-7253.69	4111.992
R5	-8109.40	5527.07
R9	1986.83	-2251.3
R10	-130970	6895.25
R13	-9977.50	7018.31
R14	-10638	8353.58
R20	4775.28	6106.22
R21	2856.60	11723.4
R26	-13579.20	2945.639
R39	-11081.00	6400.00
R53	-11855.00	714.84
R83	3460.44	12290.50
R90	9107.89	3986.56
R114	8510.00	9157.00
R245	-6973.80	11182.90
R302	5200.00	2400.00
R387	6787.00	3652.00
R713	4509.18	-4553.36
X and Y Coordinates are plant specific		

Table 4
Outfall X and Y Coordinates

Outfall	X	Y
K001	-7806.25	-146.875
K008	-7721.88	-1843.75
K011	-621.875	-2953.13
K012	-574.364	-3930.21
K013	-1009.38	-5056.25
K020	-1925.87	5424.411
C-613	-7558.77	-11.31
L4	-8951.71	319.68
X and Y Coordinates are plant specific		

Table 5

Monitoring Well X and Y Coordinates

Well #	X	Y
MW66	-6872.62	978.57
MW84A	-5975.23	-804.20
MW87A	-5825.09	-804.98
MW90A	-5688.64	-793.68
MW93A	-5994.81	-1028.57
MW98	-3281.31	7397.46
MW133	-1715.66	9124.70
MW135	-1520.05	9137.28
MW139	-576.59	6189.67
MW146	-5684.18	13549.15
MW168	-4822.50	-924.80
MW185	-6601.90	952.90
MW233	-5530.15	7300.335
MW236	-5087.79	7919.994
MW247	-7445.70	1360.147
MW252	4228.397	5717.894
MW257	-5972.21	442.3827
MW261	-5979.20	442.1934
MW284	1589.999	913.4824
MW339	-6468.50	663.20
MW340	-6165.40	665.50
MW356	-1466.38	863.45
MW366	-2246.10	6121.18
MW381	-4892.90	7745.84
MW420	-5793.53	-1041.57
MW421	-4335.43	-1084.18
MW422	-4365.74	-1083.80
MW423	-4389.45	-1084.00
MW424	-4405.68	-1148.44
MW425	-4407.35	-1226.18
MW427	-9390.18	9.54
MW433	-4526.72	12219.07
MW439	-2679.36	12575.82
MW440	-2688.23	12564.90
MW441	-2696.03	12552.96
MW442	-2827.07	11896.27
MW447	-2424.29	11310.49
MW455	-7557.43	1963.20
MW456	-7560.77	1953.78
X and Y Coordinates are plant specific		

Table 5 Continued

Monitoring Well X and Y Coordinates

Well #	X	Y
MW460	-6616.28	1944.07
MW469	4049.53	8037.38
MW470	4066.18	8033.74
MW472	4904.89	7822.45
MW498	-6767.51	1106.62
MW502	-7927.08	1981.00
MW506	-4013.04	-1939.93
MW507	-4013.00	-1939.89
MW529	-3362.39	-1675.23
MW542	-6807.55	-1704.10
MW543	-6761.36	-1729.40
MW546	-6964.33	-1743.20
MW547	-6940.44	-1702.99
MW548	-6168.19	-1061.78
X and Y Coordinates are plant specific		

Table 6
TVA Water Level X and Y Coordinates

Well #	X	Y
SHF-D10	-6130.60	16359.20
SHF-D11B	-6385.92	18190.06
SHF-D17	1782.156	12391.45
SHF-D27	-535.942	13306.34
SHF-D30B	-1414.04	17085.19
SHF-D74B	-3124.52	17402.59
SHF-D75B	-5553.68	15864.71
SHF-D8A	-3860.94	13981.72
SHF-201A	-12888.49	17297.87
SHF-201B	-13266.91	17195.91
SHF-201C	-13114.97	17242.01
SHF-102G	-4839.182	12273.117
TVAGW-1D	2305.382	8519.814
TVAGW-2D	4770.208	8073.758
TVAGW-3D	2759.29	10423.70
TVAGW-4D	3294.697	10357.20
TVAGW-5D	4012.515	10380.98
TVAGW-6D	4839.378	10083.34
X and Y Coordinates are plant specific		

Figure 1. Residential Well Sampling Locations

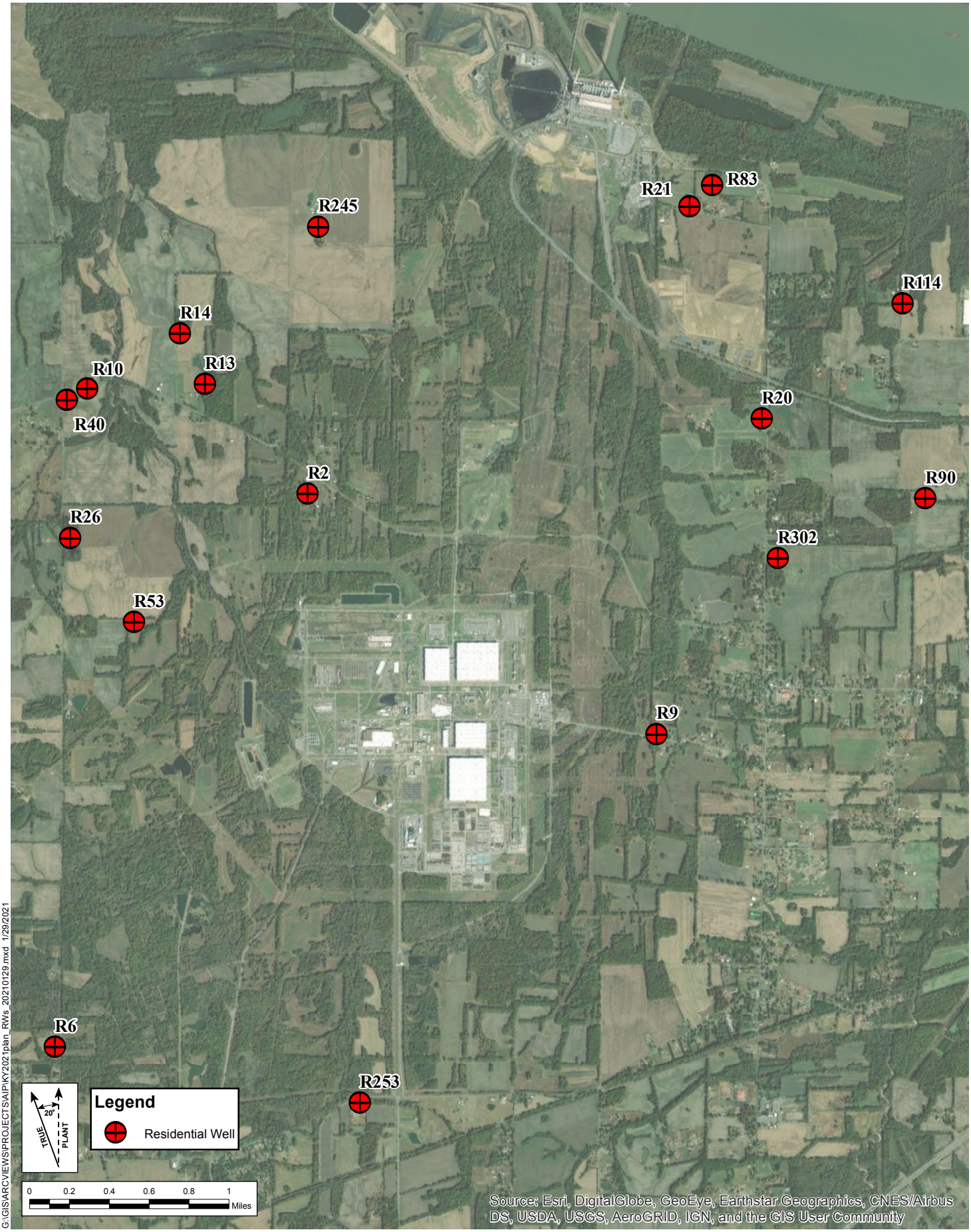

Figure 2. Outfall Sampling Locations

Figure 3. Groundwater Sampling Locations

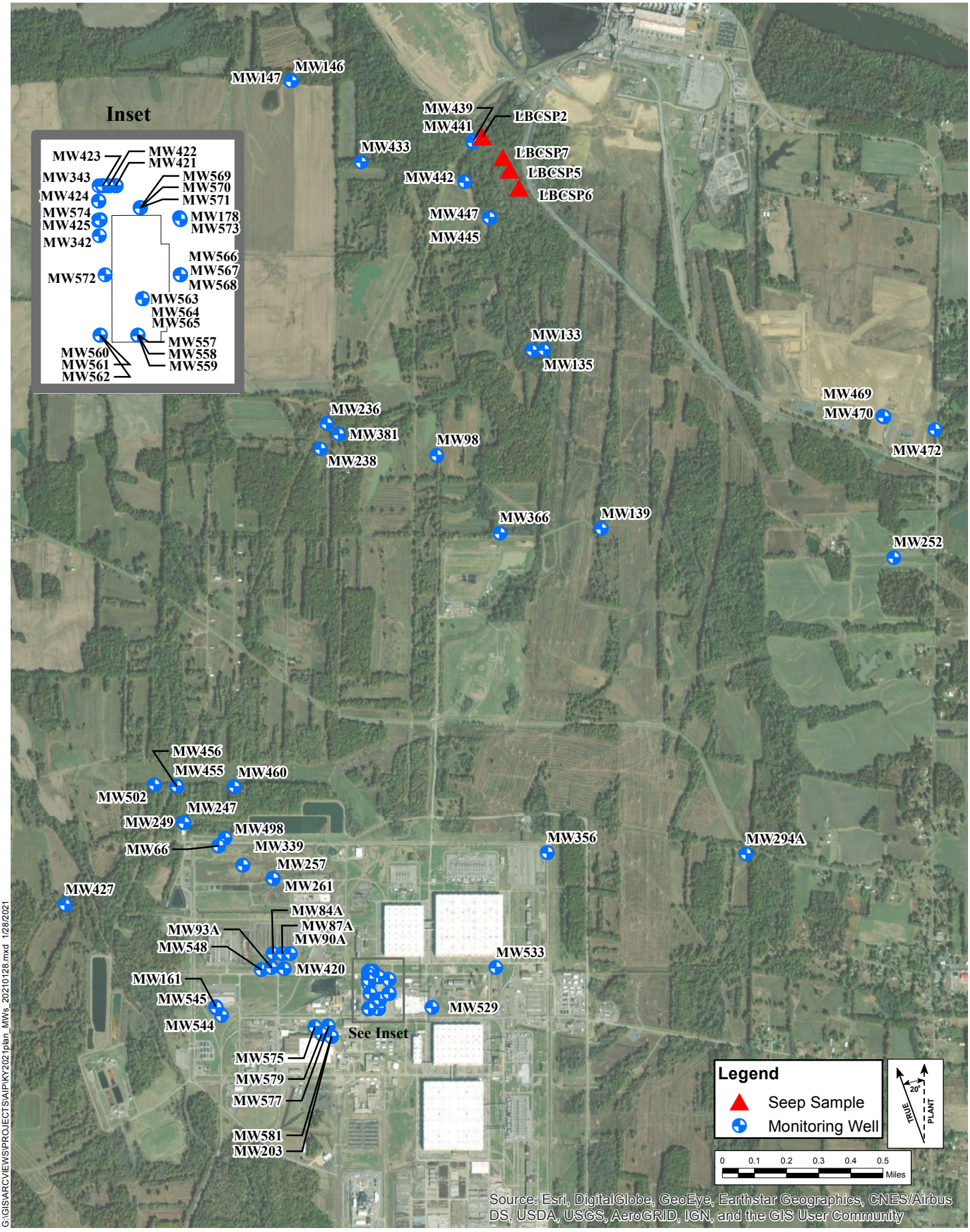

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Figure 4. TVA Synoptic Water Elevation Points